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CASE STUDIES IN PUBLIC/PRIVATE COOPERATION TO REVITALIZE AMERICA:

COAL

A STUDY

Prepared for the Use of the

JOINT ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

July 22, 1982

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Letter of Transmittal
July 21, 1982

To the Members of the
Joint Economic Committee:

I am pleased to transmit herewith a staff study entitled, "Case studies in Public/Private Co-operation to Revitalize America: Coal." This is the latest in a series of studies conducted by the Joint Economic Committee to examine new opportunities for industrial development which can act as catalysts in job creation and overall economic development. Previous studies have focused on prospects for the development of high-speed passenger rail and semiconductor industries in the United States.

This study is premised on the fact that the desired levels of U.S. economic growth through the end of this century will mean great increases in U.S. energy needs. The one source which is the most available, cost-effective, secure, and convenient is coal. In a series of findings and recommendations, the study argues that both the public and private sectors should take steps to ensure that coal's expansion proceeds in a manner which is orderly, expeditious, and environmentally safe. If accomplished effectively, the renewal of America's coal industry can not only help satisfy our energy needs, but also make an important contribution to the basic health of our economy.

Henry S. Reuss
Chairman, Joint Economic Committee

Letter of Transmittal
July 19, 1982

Honorable Henry S. Reuss
Chairman, Joint Economic Committee

Dear Mr. Chairman:

Transmitted herewith is a staff study entitled "Case Studies in Public/Private Co-operation to Revitalize America: Coal." The study was prepared by Mark Bisnow of the Committee staff, and based in part on expert testimony presented earlier this year before the Committee. The manuscript was typed by Jane Bennett and Pam Reynolds.

The views contained in the report are those of the author, and do not necessarily reflect those of the Members of the Joint Economic Committee.

James K. Galbraith
Executive Director, Joint Economic Committee

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Private capital for mining, transport, and export of increased amounts of coal is readily available and should be mobilized in cooperation with the Federal Government. A program of expanded coal production should be pursued in a "systems" framework, resembling the comprehensive and intensive effort undertaken in getting a man to the moon in the 1960's.

CASE STUDIES IN PUBLIC/PRIVATE COOPERATION TO REVITALIZE AMERICA:

COAL

Finding #1

Even with vital measures to encourage energy conservation, the amount of energy required to support expected economic growth to the end of the century will need to be much larger than that provided by current levels of energy production.

A real growth rate of 3 percent in the Gross National Product (GNP) during the next two decades will require a minimum of 1.8 percent annual growth rate in energy supplies. This calculation assumes significant achievements in both energy conservation and energy efficiency, and is the ratio currently employed in many projections of future energy demand, including those of the World Coal Study.1/ The ratio has declined from the one-to-one correspondence observed in the mid-1960's.2/ The projection of an annual growth rate of 3 percent in real GNP is consistent with widely accepted economic forecasts.3/

1/ The World Coal Study was an international project involving 80 experts from 16 major coal-using and coal-producing countries, and directed by Professor Carroll Wilson of MIT. Its final report, the product of 18-months work, was issued in 1980.

2/ Testimony of Professor Carroll Wilson, Massachusetts Institute of Technology January 13, 1982.

3/ See, for example, Wharton Annual and Industry Model, Extension to the Year 2000, Wharton Econometric Forecasting Associates, February 1982.

The assumption that significant conservation can be achieved by the year 2000 -- a savings in the range of 25 percent of energy used per unit of economic activity -- may also be optimistic. While the first 10 to 15 percent of energy savings can be obtained by relatively modest measures such as improved home insulation, higher levels will require significant capital expenditure. If such a level of conservation is not achieved, the already demanding rates of energy growth foreseeable in coming years will only become greater.

Regrettably, the Administration's budget priorities threaten the virtual elimination of government-sponsored energy conservation efforts. The budget submitted by President Carter in Fiscal Year 1981 proposed $925 million for conservation; this was reduced in last year's Reconciliation legislation to $675 million. The Reagan Administration has proposed $409 million for conservation in FY 1982, and only $22 million is proposed for fiscal year 1983. This last figure implies an end to DOE's weatherization grants for low-income citizens and for schools and hospitals; and a curtailment of the Energy Extension Service, which provides information on standards for appliance efficiency as well as for energy performance in buildings.

Finding #2

Coal is the resource of choice to fill the energy gap, at least until new sources of renewable energy can be developed on a large commercial scale, which is not expected to happen until well into the next century. In the meantime, supplies of oil and natural gas are diminishing, and the perceived danger and cost of nuclear power has made its expansion and desirability at best uncertain.

The supply of oil to Western industrialized countries, the basis of spectacular economic growth in the post-war era, has become both constricted and vulnerable. This situation has eased somewhat during the current recession, but underlying conditions remain precarious. Indeed, in light of depressed market conditions, production cutbacks have been announced in an effort to preserve certain price levels.4/ Oil-producing countries have increased their own domestic energy consumption to support ambitious development plans; and to assure future income, they

4/ During the JEC hearing, Chairman Reuss asked Professor Wilson, "Does the fact that oil is less scarce in world markets than it was two years in any way invalidate the conclusions of {The World Coal Study} which generally said that coal production and consumption is to treble in the next 18 years?" Professor Wilson replied: "Well, I think the price hasn't softened very much in the oil market. It's held pretty firm...and it was our estimate that because of the very large coal reserves, because of the profitability, if you will, of mining and selling coal at present levels, that the differential between coal prices and oil prices would be sustained in the future....That differential has largely remained."

have at times seem inclined to stretch-out their oil reserves.5/ Concern about the socio-political ramifications of overly rapid social change -- an arguable cause of the fall of the Shah in Iran -- has also injected a note of caution in the setting of production levels. Non-OPEC developing countries can also be expected to raise their demand for imported oil as their economies over time experience increased industrialization.

While increased production is expected from oil fields in such areas as Prudhoe Bay, the North Sea, Mexico, Norway, and China, in the aggregate these supplies will be modest in comparison to new demand. The fact that oil prices are not expected to rise rapidly will probably exert a downward influence on drilling rates and marginal oil exploration efforts. The basic supply of world oil will remain highly concentrated in the Middle East, the world's most volatile region. Two-thirds of OPEC oil today flows through the Straits of Hormuz in the Persian Gulf. Events such as the revolution in Iran, the current Iran/Iraq war, and past Arab oil embargoes make clear the importance of more

5/ This was the central conclusion of a report issued in May 1977 by the Workshop on Alternative Energy Strategies. Professor Wilson, who directed that study, testified to the Committee: "This was considered a very pessimistic view four years ago; events since then have confirmed that it was in fact rather optimistic."

diversified sources of energy. In any event, the World Coal Study (WOCOL) has concluded that even if OPEC production continued at 30 million barrels a day through the next 20 years, its highest level in recent times, importers in the OECD area 6/ could in all likelihood count on no more than 22 million barrels a day of this. WOCOL concluded:

> We believe that oil will provide, at most, a small fraction of any future increase in world energy needs. Indeed, the availability of oil for import by the OECD nations is likely to be less in the year 2000 than today.
>
> Many alternatives to oil are not currently economic.

Expansion of natural gas production, for example, is hampered by large capital requirements, especially for export in liquified form, as well as by restraints imposed on exports by those OPEC nations which are also significant natural gas producers and display the same protective attitude toward their gas reserves as they do toward their oil reserves. 7/

6/ The Organization for Economic Cooperation and Development (OECD) is an association of the leading 23 Western industrialized countries including Japan, Australia, and New Zealand.

7/ Coal: Bridge to the Future, Report of the World Coal Study, p. 8.

The possibilities of nuclear power remain unclear. Costs of construction, delays in licensing, and public skepticism have combined to make its future uncertain. Even assuming these obstacles could be overcome, a realistic rate of expansion of nuclear power would not be adequate to meet rising energy requirements. Solar energy has impressive long-term potential, but the technology remains in its infancy and through the year 2000 does not appear to lend itself to commercialization on a significant scale, particularly in the critical industrial and power sectors. Such a source of energy should be pursued aggressively for the benefits it can bestow in the next century, as should other renewable sources such as hydro-electricity, geothermal, biomass, ocean thermal gradients, wind, wave, tidal power, and many others. But their potential for near- or medium-term contribution should be judged realistically.

What source is left? WOCOL came to the following conclusion:

> The world...needs an incremental energy source as nearly like oil as possible, but with the vital difference that it will be obtainable in increasing amounts until well into the next century. Ideally, and if it is to fulfill the role played by oil over the past decades, it should be versatile in application, easily transported and stored, and reasonably priced. The technology for using it should be mature and generally available so that it can be brought into use rapidly, widely, and safely. It should be capable of satisfying strict environmental standards with presently-available technology and at a cost competitive with other fuels. It should be obtainable in the large quantities and for long enough to justify the investments required to bring it into widespread use. Only coal comes close to meeting these specifications.

The desirability of increased coal production has been acknowledged repeatedly by Western industrialized countries. The

Tokyo communique of the seven-nation economic summit of June 1979 stated:

> We pledge our countries to increase, as far as possible, coal use, production, and trade without damage to the environment. We will endeavor to substitute coal for oil in the industrial and electrical sectors, encourage the improvement of coal transport, maintain positive attitudes toward investment for coal projects, pledge not to interrupt coal trade and our long-term contracts...and maintain, by measures which do not obstruct coal imports, those levels of domestic coal production which are desirable for reasons of energy, regional, and social policy. 8/

In May 1979 the Ministerial Council of the International Energy Agency, comprising some 20 nations, including the U.S., adopted Principles for Coal Policy to realize the common objective of expanding: (a) the use of coal as an alternative fuel; (b) the production of coal to meet this increased demand; (c) international trade in coal to meet increased demand.

These countries also committed themselves to assess their environmental policies and practices affecting coal mining, transport and combustion, disposal of coal wastes and land reclamation, and where necessary, to amplify and clarify them.

8/ The seven countries signing included: Canada, France, West Germany, Italy, Japan, the United Kingdom, and the United States.

The governments also undertook systematically to review the implementation of these principles in the national coal policies of individual IEA countries.9/

Finally, the cost advantage of coal should be noted. At least as resources are presently priced, coal is a much less expensive energy source than oil. If oil costs $35 a barrel, for example, the energy equivalent price for a ton of standard coal would be, according to WOCOL, $165. In fact, coal sells today for only $25 to $35 a ton. Indeed, much of that price is accounted for merely by the cost of delivery. In Japan, a study which calculated all the environmental costs now required in that country for the processing of coal (standards which are the most stringent in the world), as well as those projected by 1985, concluded that these costs add only $35 to the overall price of coal. Since the landed cost of coal in Japan in this study was $48 a ton, the resulting price of $80 to $85 for clean coal still proved a bargain compared to oil. (Of course, it must be acknowledged that oil can be used much more easily in some circumstances than can coal, and the price differential to some extent reflects this superior versatility.) Japan has high hopes for displacing oil with coal. One study has projected an

9/ For text as adopted by the Governing Board of IEA, May 21-22, 1979, see Addendum I. Report of the Coal Industry Advisory Board, IEA/OECD, Paris, 1980.

increase in annual use from six million metric tons of coal equivalent in 1977 to a range of 57 to 72 million metric tons by the year 2000. Concommitantly, oil-based electric power is predicted to decline from using 100 million metric tons of coal equivalent in 1977 to 43 million metric tons in the year 2000.10/

Professor Wilson estimated before the Committee that the decline in the availability of imported oil in the next 20 years, given projected OECD-area energy requirements, requires that world coal use double by the year 1990 and triple by the year 2000, compared with a base of one billion tons consumed in 1977. He also estimated that the world trade in steam coal would have to increase 10 to 15 times its present level to accommodate the dramatically rising import requirements implicit in these estimates. The World Coal Study supports the conclusion that coal will have to meet between 55 and 65 percent of increased energy needs of the entire OECD area during the next two decades.

In short, it is not surprising that four successive U.S. Administrations have looked to coal as an important component of energy policy. If energy supplies are to expand, as they must if GNP is to grow, it is not nuclear power or oil or more exotic forms of energy, but coal, which represents the most available, flexible, and cost-competitive alternative source.

10/ Future Coal Prospects: Country and Regional Assessments, Vol. II of The World Coal Study.

Finding #3

The United States has the capability to undertake a significant expansion in its production and export of coal.

Until the current economic recession, U.S. coal output has expanded 5 to 6 percent a year for the last decade. This is a remarkable change from the decades following 1930 when coal use and output declined regularly year to year; locomotives were predominantly coal-fired in 1930, for example, but largely oil-fired by 1950. Domestic heating also switched dramatically from coal to oil. U.S. coal consumption in 1980 was 25 percent greater than its level in 1975 and 75 percent greater than its level in 1960, much of this consumption accounted for by electric utilities. Over half of the electricity generated in the United States is today the product of coal-fired boilers. Assistant Secretary of Energy Jan Mares estimated before the Committee that U.S. coal-fired generating plants already operating, under construction, or planned, will require at least 880 million tons of coal annually by 1990, an amount which exceeds the level of coal produced today in the United States for all uses.

Nonetheless, Secretary Mares stated that, despite continually increasing demand, many of the Nation's coal fields are at present functioning significantly below capacity, only partly due to a production loss of 30 million tons suffered as a the result of the 72-day coal strike in the spring of 1981. The American coal industry is flexible enough in its capacity utilization that coal production easily increased from 776 million short-tons in

1979 to 824 million in 1980. New coal technologies, the development of which is being stimulated to some extent by recently enacted tax incentives for industrial research and development (R&D), may make possible reduced transportation, capital, and labor costs, increasing production potential still further.

Eugene Samples, Chairman and Chief Executive Officer of Consolidated Coal Company, a division of CONOCO, testified to the Committee that:

> Coal production could easily double, without any appreciable real price increase, and the reasons are simple. The United States' huge reserves are readily available and can be mined with established technology, and the competition is fierce among the more than 3,000 coal companies vying for a share of the market.

The World Coal Study has estimated that, even if a three-fold expansion in world coal production were achieved by the year 2000, the cumulative production during the 1977 to 2000 period would exhaust only 15 percent of the world's present technically and economically recoverable coal reserves, as currently estimated.

One constraint on production, however, is the question of how to mandate and finance conversion of power stations to coal. The expense of converting oil stations back to coal can, in some cases, be greater than the expense of building new coal-fired power plants from scratch. There is also uncertainty which

exists in the United States and elsewhere as to the rate of growth of electric power. For the 20 years prior to 1974, electric output grew at a rate of 7 to 8 percent a year, but following the first round of OPEC price increases, the power industry began to experience a holding pattern with electric output expanding at an average rate of only about 3.5 percent a year. In many respects, the power industry has excess capacity at the present time, and yet lengthy lead times are required for the development of coal-fired power plants. While the use of coal will continue gradually to increase, not until the traditional growth pattern of electric power consumption resumes--following revival of general economic growth--will the electric power industry begin to anticipate its future needs and set in process the siting, permitting, and construction of new power stations based on coal.

Finally, much of the coal reserves of Western States are owned by the U.S. Government. Leasing was suspended in 1972, as a result of a lawsuit (brought by the Natural Resources Defense Council on behalf of Western ranchers) attacking inadequate environmental controls. President Carter reinstated a Federal coal leasing program in 1977, and the first coal lease was issued in 1980. Up to 1972, however, over 16 billion tons of Federally-owned coal had been leased. While a large amount of coal is thus already under lease (7 billion tons in Wyoming alone), much of this remaining for the time being in undeveloped status due to

slack market demand, a major expansion of coal production could merit renewed attention to leasing procedures.

As for U.S. coal export potential, this, too, is considerable. In 1979, the U.S. exported about 67 million short-tons of steam coal and coke of which about 23 percent was steam coal. In 1980, the level of exports rose to 94 million short-tons, of which steam coal represented 29 percent. In 1981, notwithstanding the miners' strike, about 100 million short-tons were exported, an amount which Secretary Mares noted was comparable to the levels predicted for 1985 by several earlier studies. Although many experts agree that the 1981 export levels may have been an anomaly, (due to supply interruptions from other net exporting countries such as Poland and Australia), exports in the long run are projected to increase at a substantial rate.

For example, the Interagency Coal Export Task Force concluded in January 1981 that "given development of export facilities, the export market for U.S. steam coal will grow rapidly and will attain a stable share of world demand...." The Task Force projected the U.S. share in the worldwide steam coal market to rise from 18 percent of 28 million short tons in 1985 to 38 percent of nearly 200 million short tons in the year 2000. 11/

11/ Interim Report of the Interagency Coal Export Task Force, U.S. Department of Energy, January 1981.

The Department of Energy projects that steam coal exports from the U.S. may increase in future years at an average rate of 8 percent or more. Using as its base a 1977 U.S. export figure of 49 million tons of coal-equivalent a year (mtce/yr) 12/, WOCOL estimates an annual U.S. export level of 125 to 200 mtce by the year 2000. The next greatest exporter, by these calculations, would be Australia at about 160 mtce/yr, with other exporters far below this level. WOCOL also estimates a category of "maximum potential" for coal-exporting countries, assuming exporting efforts that are both unusually ambitious and successful. In this category, the U.S. has an export potential of 350 mtce/yr and Australia 200 mtce/yr.13/ Demand from nations in Europe and East Asia for imported coal sufficient to meet their increases in economic growth over the coming decades is expected to be substantial. The U.S. has the opportunity to be what some have called the "swing" exporter of coal, given its present and expected future capacity. WOCOL estimates that worldwide steam coal import needs will rise from a 1977 level of 50 million tons a year to an annual range of 500 to 700 million tons by the year

12/ A standard measure of a metric ton of coal equivalent to a heating value of 12,600 btu/lb.

13/ The increase in exports which is foreseen would be almost exclusively in the realm of steam coal, exports of which until recently have been neglible, but which have risen dramatically in the past two years, well above the fairly steady export of metallurgical coal. Metallurgical coal is practically a chemical, used in steel-making; steam coal is used for heat in boilers, for the generation of electricity by utilities.

2000. This underlines the opportunities ahead for U.S. exporters to obtain a major share of the expanded market.

Finding #4

A revitalized coal industry could prove a catalyst for American reindustrialization, which the Joint Economic Committee has shown in previous reports could also result from expanding the passenger rail and semiconductor industries.

In the 19th century, the construction of canals and railroads had an impact far beyond their own immediate spheres; an entire transportation network developed and the commerce thereby induced contributed mightily to America's industrial revolution. In the early part of this century, the birth of an automobile industry had an immense impact on the national economy, as did the development of the television and computer industries more recently.

While expansion of coal use and production has an obvious effect in reducing American dependence on overseas sources of oil, and in facilitating economic growth, it also holds considerable potential for the expansion of support industries and the creation of jobs. Production of such items as large shovels, heavy carriers, and new underground mining machinery will be required for expanding mining operations. New and converted boilers, as well as equipment for fluidized bed combustion, coal cleaning, scrubbing, particulate control, and ash disposal will be needed for improving both productivity and

compliance with environmental standards. Transportation facilities will need to be expanded. River transport in some cases may have to be modernized, for example, though this must be done only in such a way as to avoid the erosion to river banks and river bottoms which has sometime accompanied such modernization.

The establishment of slurry pipelines is another prospective concomitant of coal industry expansion. In addition, new deep-sea ports may have to be dredged, depending on which ports become lead exporters (some ports are naturally deep) and the availability of certain technological capabilities, such as that which would permit the slurrying of coal out to ships berthed in deeper water or the development of shallow-draft ships constructed in place of larger deep-draft coal carrying ships.

John Hertog, Senior Vice President for Coal and Taconite of the Burlington-Northern Railroad Company, testified to the Committee about some of the economic benefits he could foresee in consequence of a program of expanded coal production. Citing a 1978 study of the Office of Technology Assessment, he estimated that in terms of railroad employment, 100 million additional tons of coal moving in unit train operation over distances of more than 1,000 miles could result in over 13,000 additional jobs. These would be, he noted, relatively high-paying jobs, resulting in a flow of wages into the numerous communities along the coal routes and beyond. Hertog went on to say:

Increased coal transportation also translates into large orders for rolling stock -- cars, locomotives, and cabooses. One-hundred million tons to be hauled 1,000 miles in unit train service would require, using times and routes typical to B-N's experience, the following equipment: 23,100 100-ton cars; 1,113 locomotives; 231 cabooses. The total equipment cost in today's dollars would be $2.3 billion. That again assumes the coal moves in unit trains; single car service could require much more investment. In addition, there could be hundreds of millions of dollars in investment required for track improvement, improved signaling, and construction of repair facilities, and added line capacity. None of this, of course, includes any of the additional investment and employment increases involved in mining the coal.

Finding #5

A program of expanded coal exports would markedly improve our balance of payments posture.

If the United States exported what WOCOL considered the maximum U.S. potential of 350 million tons annually by the year 2000 -- a figure which would represent about 20 percent of total U.S. coal production -- the potential is enormous for new foreign exchange earnings; at $35 a ton (a conservative estimate of coal prices), such a level of exports could yield revenues of $17 billion per year in 1979 dollars.

The development of a major coal export industry could create in itself a great number of new jobs in the United States, as well as offset our trade deficits with countries such as Japan. Finally, such an industry is important for the sake of the security of our allies who will increasingly need energy supplies

to permit their own continued economic growth. Appropriately, the development of an enlarged U.S. coal export industry has been an expressed goal of all recent Administrations.

Recommendation #1

The Federal Government should increase its research and development efforts to improve coal mining and coal use.

The development of new technologies is required to meet increasing standards of safety, productivity, and environmental protection (examples include new techniques for surface reclamation, electric power conversion, and safer roof bolting of underground mines). The private sector cannot be expected to conduct all of the necessary research and development. Given uncertainties of production trends and future demand, as well as limited incentives for profit-making businesses to develop technologies to meet social needs, a stepped-up government role may be appropriate.

Federal expenditures for fossil fuel R&D, which have declined from $999 million in FY 1981 to $417 million in FY 1982 and are proposed at a level of $106 million for FY 1983, should be restored to the FY 1981 level (the lion's share of this funding is for coal). Among the programs proposed to be dropped, for example, has been one sponsored by the Department of Energy to develop a coal/oil mixture for use in electric power generation. Such a product would permit the use of existing oil-burning equipment and could reduce the consumption of imported petroleum.

equipment and could reduce the consumption of imported petroleum. New commercial uses of coal that reduce the use of oil serve a national goal and should receive government encouragement. Also affected is the budget of the Mineral Research Institute of the Department of Interior, although its studies of recent years have proved highly useful in the improvement of technologies for mining, reclamation, and worker safety.

One encouraging, if limited, development was described to the Committee by Secretary Mares:

> We are fashioning a Federal Coal Research Program to complement...private sector initiatives. We are attempting to reorient the government's activities to efforts that would not duplicate or compete with privately funded projects. Our focus is on the leading edge of new technological concepts and on achieving a better understanding of the fundamental mechanisms that work in coal processes. The research to be funded with Federal dollars is that which industry will not perform because the payoffs, although potentially significant, are frequently difficult to predict, too far into the future, are not capable of being captured by individual firms.

Nevertheless, serious concern has been expressed as to private industry's willingness and ability to assume the responsibility for developing these technologies.

Other environmental problems associated with coal, such as acid precipitation, can evidently be addressed with present technology if rigorous standards are set and strictly enforced. It was the conclusion of the World Coal Study, which the Committee shares, that environmental problems other than those relating to carbon dioxide emissions can be addressed effectively by use of present technology and at an expense that would not be

prohibitive. Nonetheless, the present state of technology can be improved. Russell Train, former Administrator of the Environmental Protection Agency (EPA), testified before the Committee:

> ...I do believe there is a need for research, particularly in new technologies. The kinds of technologies we have had in the past to clean up coal have generally been enormously expensive, largely the reason for the strong resistence to their installation, primarily by utilities. I think the fluidized-bed technology, particularly pressurized fluidized-bed...is very promising. I would point out...that the EPA had an ongoing research program in this area in cooperation with industry. It does no longer. Perhaps that has been shifted to the Department of Energy....I merely mention this to emphasize my concern that in addition to standards and the installation of control technologies there is an important role for continued research, if the premises of the World Coal Study are to be borne out.

Clearly, popular approval of a program of expanded coal production will require a public confidence that safety, environmental, and health standards of the highest degree can be maintained. Federal assurances, as appropriate, will encourage such confidence.

Recommendation #2

To enhance the safety and efficiency of coal production, improvements in technology and machinery should be encouraged.

William Wearly, Chairman of the Executive Committee of Ingersoll-Rand, testified before the Committee that:

> Coal growth is highly dependent upon the availability of more productive equipment and that equipment availability is hampered considerably by road blocks inadvertently placed by government...Please be assured that our problems today do not involve limitations to manufacturing capacity.

Wearly noted that the productivity increase in coal mining during the last 40 years has rivaled that experienced in the agricultural industry, increasing from less than 3 tons per man shift in the early 1930's to 19.9 tons in 1969. Wearly argued that the decline in mine productivity which has been experienced since that time -- and which he noted was coincidental with the introduction of the Coal Mine Health and Safety Act -- can be offset by improved productivity in machinery as well as by improved productivity in coal use. With respect to the latter, Wearly noted that the heat rate (how many btu's are used per kilowatt hour generated) has enjoyed continuous improvement over the past 30 years. This, he said, was due largely to improved combustion technology and the move to higher pressure boilers. The decline experienced in the combustion efficiency of coal since the early 1970's -- which Wearly noted was coincidental with the introduction of the Clean Air Act -- can, he said, also be offset by improved productivity.

Wearly offered this conclusion:

> (a) way in which your Committee could be helpful is in calling for the expenditure of small amounts of seed money for high-payout research and development. Projects that will greatly improve coal's efficiency and expedite the revitalization of the coal industry, yet that are too general to benefit any one private company sufficiently to justify private investment.

Secretary Mares noted before the Committee that "the technology for direct utilization of coal by industrial and utility consumers has not changed significantly over the past 40 to 50 years." Wearly mentioned pressurized fluid bed combustion as an example of an important subject for R&D efforts. 14/

14/ Fluidized bed combustion is the burning of pulverized coal suspended by air in a chamber ("bed"). The combustion occurs at lower-than-usual temperatures, thus reducing the production of nitrogen oxides. The technique can incorporate the use of suspended limestone as well. Such combustion removes many of the sulfur oxide pollutants, and can be accomplished either at normal atmospheric pressure or at higher pressures. In some cases, useful by-products can also result.

Recommendation #3

To facilitate the transportation of coal, Congress should consider enacting legislation to permit the granting of eminent domain for the construction of coal slurry pipelines.

Such legislation is currently before the Congress (H.R. 4230, sponsored by Rep. Udall; S. 1844, sponsored by Senator Johnston). The House bill allows the Interstate Commerce Commission, upon review, to issue certificates of "public convenience and necessity" to pipeline operators for purposes of acquiring rights-of-way through private lands; the Senate version vests this authority in the Department of Energy. Both bills provide express assurance that no water within any State may be appropriated except pursuant to State substantive and procedural law.

Coal slurry pipelines pump a coal and water mixture underground from the a central point of transmission to its point of end-use consumption by a utility plant. Only one slurry pipeline is today in operation, a 273 mile long pipeline running from Arizona to Nevada, but numerous new pipelines are proposed. The Coalstream pipeline, for example, would run from Southern Illinois to West Virginia, and on to Florida, and would be 1,500 miles in length; its capacity would be 25 to 35 million tons of coal annually compared to the 4.8 million ton capacity of the current Arizona to Nevada pipeline.

In testimony before the Committee, Allen D. Dorris, President of the Coalstream Pipeline Company, a subsidiary of the

Continental Group, explained the need for Federal eminent domain legislation:

> Faced with active railroad opposition, State legislatures cannot deal effectively with the issue of eminent domain for coal pipelines in their usual abbreviated sessions, particularly when the fundamental issues of providing essential State services are today so difficult and time consuming. These practical problems are particularly true in those States that serve merely as hosts and do not benefit directly from either the production or consumption of pipeline coal. In fact, such States may encounter legal difficulties in identifying benefits to their citizens that would support the grant of State eminent domain authority to such coal pipelines. Similar difficulties led to the amendment of the Natural Gas Act in 1947 to grant Federal eminent domain authority to interstate natural gas pipelines; the enactment of the Cole Act in 1941 to grant Federal eminent domain authority to several interstate petroleum pipelines; the grant of Federal eminent domain authority to the land grant railroads; the grant of Federal eminent domain authority to interstate bridge companies and to certain interstate bridge companies and to certain interstate electric transmission projects.

Coal slurry pipelines should be allowed to compete fairly in the marketplace with railroads and other forms of surface transportation. This is so not only for the sake of competition per se, but, because of the expected effect competition would have on reducing transportation rates to consumers. In

addition, it appears that over time slurry pipelines, assuming that they enjoy a constant flow of coal, may be intrinsically less expensive to operate than are other modes of transportation. This is because most of their costs are one-time and "front-end" capital costs. Of course, costs of construction are an important consideration, and must be borne in mind in any comparison of overall railroad and slurry costs. Still, it is significant to note that the cost of maintenance and labor in the case of slurry pipelines is modest compared to that required for the operation of railroads. 15/ In some cases, the cost of transporting coal by railroad is today larger than the mine-mouth cost of coal. (In the case of Burlington-Northern v. City of San Antonio two years ago, evidence was presented that coal could be imported more cheaply from South Africa than what it cost to purchase coal transported by rail from Wyoming.)

15/ Mr. Dorris noted to the Committee: "Unable to negotiate for lower unit train rates for its coal shipments, Consolidation Coal Company built and operated an intrastate coal pipeline in Ohio. For six successful years, the pipeling transported coal at rates consistently lower than existing competing rail rates. In 1963, as a result of the success of this coal slurry pipeline and the threat of other proposed pipelines, the competing railroad finally agreed to negotiate unit train rates for the complete region. The rail coal haulage rate dropped from $3.47/ton to $1.88/ton. At this time, the pipeline, having achieved its purpose, was put in reserve. A current example of transportation cost savings is the Black Mesa pipeline in Arizona which today transports coal for about one-half the cost to transport it by rail."

Finally, given that it is a national goal to reduce consumption of oil and gas, every effort should be made to enable utility plants to obtain economical supplies of coal for use in electric power generation. Coal slurry pipelines may offer an advantage both in convenience as well as cost, and may also help to avoid the disruptive socio-economic effects sometimes associated with large-scale railroad transport.

Slurry pipelines require water. Western coal mining states see slurry pipelines as competing with their own needs for agricultural water. States with abundant water supplies, such as the Great Lakes States, are also claiming the right to protection against undue diversion, and the right to adequate compensation for what is diverted. The technological feasibility of pumping water supplies into coal-producing areas for use in the operation of slurries is uncertain and must be closely evaluated before final approval of these projects is given.

With respect to exports, it is also possible that slurry pipelines could eliminate the need, in some cases, for the dredging of deep water ports: Ships could be loaded by means of slurry conveyers, with on-ship dewatering. However, de-watering the coal slurry offshore could also have environmental consequences. 16/ The concept of shipping coal slurry overseas must be classified as futuristic. Shipping coal in a slurry -- the water content of which detracts from the energy content of the cargo -- would be uneconomic.

16/ Mr. Dorris assured the Committee in response to questions that dirty water would not be discharged into the ocean, citing legal restrictions. He also noted, with respect to pipelines carrying coal slurry to power plants, that technologies existed to treat dirty water to virtually whatever degree of cleanliness desired, and that this water would be sufficient to satisfy up to 15 percent of a power plant's requirements for water.

Recommendation #4

To improve coal export potential, the Federal Government should encourage further development of coastal port facilities.

A major expansion of coal exports will require the dredging of existing ports or the building of new ports.17/ The majority of vessels now carrying coal can accommodate about 50,000 tons of cargo when fully loaded. The international coal trade currently projected for the year 2000, however, will require the use of considerably larger vessels, probably carrying about 100,000-150,000 tons of coal. Few American ports, given channel depths of about 45 feet, are in a position to receive vessels of this size. At one point last year, during a time of suddenly increased coal demand, over 100 ships were lined up in Hampton Roads waiting for coal. (Some reports have indicated that part of the port congestion experienced during the 1980 to 1981 period was due not merely to inadequate port capacity, but also to the arrival on the scene of numbers of novice traders. These traders, attracted by the prospects of lucrative business, are said to have created much unnecessary confusion.)17/

16/ In June 1980, the Maritime Administration of the Department of Commerce published a study which concluded that 15 new coal ports would be required by 1990 to handle projected coal export traffic. More recent reports have indicated that dramatic forecasts in 1981 of greatly increased export demand and the need for new port development were likely overdrawn, or at least premature.

17/ Journal of Commerce, February 22, 1982.

Fortunately, although the ports have not been dredged, improved "designated berthing" procedures by the railroads in conjunction with short-term declines in export coal demand have largely eliminated the problem. It should be emphasized, however, that this solution is a short-term one, and that if the United States is to compete successfully in future world coal trade, it must take aggressive action to improve and increase its port capacity.

Private interests have shown much recent interest in developing export-oriented ports on their own. However, they do not necessarily see a potential return on investment sufficient to justify their development of deep-water ports to accommodate ships of 100,000 tons or more. There are such ports already in existence in England, South Africa, and Italy. The dredging of harbors and shipping channels to a minimum of 55 feet would enable exporters to accommodate many larger colliers, but companies are reluctant to do even this in the absence of long-term contracts between U.S. exporters and overseas consumers, or a system of Federal guarantees or user fees. More importantly, some central authority may be needed to decide which of two or three such deep-water ports should be dredged and developed. There is no sense in such costly exercises being performed indiscriminately, and private investors will be keen to ensure that they are not going to undertake a major project only to discover that there is in the end an excess of facilities.

The Federal Government should continue its efforts, by means of the Coal Interagency Working Group, to relieve any unreasonable regulatory burdens which may have frustrated

development of port facilities. Nonetheless, legitimate environmental concerns must be recognized. Section 404 permits, required under the Water Pollution Act of 1972, though sometimes burdensome, are often of considerable environmental consequence. Port projects in fragile estuarian areas must be sound; the U.S. is losing an estimated 300,000 acres of wetlands a year. Some have asserted that plans for disposal of dredge spoil in Mobile Bay (Alabama) could eliminate as much as 5 percent of the bay, an area which provides a vital habitat for commercial and sport fisheries along the Alabama coast. Similarly, the river bottom sediments in the harbor at Baltimore are said to be contaminated with a range of deadly chemicals. Dredging at Baltimore, under these circumstances, could adversely affect circulation patterns in the lower Chesapeake Bay and harm productive oyster beds. The impact of a deepened channel to the Atlantic from the bay is not well-known. These are the concerns which must not be neglected in the effort to expedite port development.

The Federal Government should explore all possibilities for redesigning coal-carrying vessels to meet the specifications of ports as currently dredged. (The Maritime Administration within the Department of Commerce has suggested the possibility that ships constructed with wider beams would not draw as much water and could be able to transport 150,000 dead weight tons of coal through channels 45 feet deep.) The Working Group should also review the possibility of moving coal by conveyer or slurry to offshore loading points, there to be loaded directly onto ships; this would seem a possibility, particularly for steam coal,

which, unlike metallurgical coal, does not need to be blended at the port before being loaded.

The Administration should identify those ports where the least amount of dredging or improvement is necessary in the short or intermediate run and devote attention to increasing the use of these ports. It may wish to take proceeds generated by the establishment of any new user fees and apply part of them to the development of a first-round of selected ports. It may also consider placing revenues, above those required to retire port debt and provide for operations and maintenance, in a trust fund earmarked for the development of a second-round of selected ports. The first-round ports would be those where the least improvement is required: Examples would include Baltimore, Hampton Roads, Mobile, and New Orleans, as well as Long Beach on the West Coast serving the Pacific Rim Basin. Second-round ports, where more development is required, could include such sites as Charleston, New York, Philadelphia, Moorhead City (North Carolina). To the extent that the U.S. Army Corps of Engineers finances port operation and maintenance, Congress may wish to give consideration to Administration-proposed initiatives for cost recovery.

The government should also consider granting preference to those ships calling in U.S. ports which intend to move coal under long-term contract arrangement. The Administration should continue to assure European and other consumers of this country's commitment to supporting American exports of long-term markets for American exports. And it should, perhaps through the Bureau of Standards, endeavor to establish with foreign governments worldwide coal steam standards.

The large cost of port development and operation, of course, mustbe considered in assessing the degree of port expansion that can be justified. The Office of Technology Assessment, in its April 1981 Technical Memorandum on Coal Exports and Coal Development, indicated that capital costs of proposed channel improvements to four ports alone (Hampton Roads, Baltimore, Mobile, and New Orleans/Baton Rouge) could total almost $1.5 billion (in 1980 dollars). Annual operation and maintenance costs were estimated to be in the range of $4 million for Baltimore and up to $19.5 million for New Orleans.

Channel improvements, which have been proposed, would create additional operation and maintenance costs OTA said, ranging from $800,000 for Baltimore to $75 million in the case of New Orleans. Clearly, a sound economic justification for port development must be established as a prerequisite to any form of government involvement.

Recommendation #5

To ameliorate the adverse environmental and socio-economic effects of expanded coal production, the Federal Government should establish national standards as required and provide needed assistance to States.

It is a responsibility of the Federal Government to maintain those minimum national standards which States may otherwise be tempted to avoid as they compete to provide a hospitable climate for business investment. The history of government involvement in surface mining reclamation is instructive. Mining went on virtually unrestricted in some coal-producing States until intervention at the Federal level occurred in the form of the Surface Mining, Control and Reclamation Act of 1977 (SMCRA), legislation which set strict safeguards for surface mining

operations. Some State governments had refused to set and enforce such restraints.18/

18/ Almost 60 percent of the country's coal is now obtained by means of surface mining. Nonetheless, it has been estimated that only 5 percent of the assumed 3 trillion tons of coal resources in the United States are close enough to the surface to lend themselves to stripping; surface mining is conducted because it is generally a less expensive and quicker way of obtaining large quantities of coal. (It is often more efficient: 90 percent of the coal in a given area is recovered, versus a 55 percent rate of recovery in underground mines.) As of the mid-1970's, estimates were that up to 1,000 acres a week were being disturbed by mining operations, and that outdoor recreation resources worth $35 million a year were being destroyed. In addition, water supplies were being polluted through acid drainage and toxic sedimentation, farm lands and soil productivity were being adversely affected, and natural beauty was being degraded. Reclamation of mine land costs just a few cents to several dollars per ton of coal, and is less costly for area mines in rolling or flat lands (although adverse climate conditions can make re-vegetation difficult, if not impossible, in some areas) than for contour lands in mountainous or hilly terrain (i.e., Eastern Appalachian coal fields). Reclamation efforts have to date met with only mixed success, if reclamation is defined to mean the restoration of mined lands to the same ecological nature and level of agricultural productivity that existed prior to mining. In addition, much of the land mined before the advent of environmental regulations has remained unreclaimed. Continued Congressional efforts to produce strong mining regulations were thwarted -- including vetoes by President Ford, who expressed concern about hampering coal production during a time of energy crisis in the mid-1970's -- until 1977, when President Carter signed into law a regulatory program requiring applicants to meet certain minimum environmental protection performance standards in order to undertake surface coal mining operations. Strong State programs were approved under President Carter, but the current Administration has signaled the States its willingness to accept weaker provisions. One other problem about which more needs to be known is the long-term effects of strip mining on the quality and quantity of aquifers which are interdicted by surface mining. Agricultural activities and domestic and municipal water supplies in the semi-arid Northern Plains are critically dependent upon groundwater resources due to generally dry climatic conditions. Some of the research which has been carried out on this problem has shown that water tables are lowered as a result of surface mining far outside the actual mined areas.

The implementation of SMCRA is in progress. Seventeen States have received approval from the Department of the Interior to administer Federally-developed regulations. While the remaining coal States have yet to win approval, however, the Administration is now beginning to weaken these Federal regulations. The Administration asserts that they are in some cases unnecessarily costly, though documentation on this point is said by some environmental groups to be questionable. In fact, the need for stringent and uniform national standards is important in encouraging public acceptance of large-scale additional coal development. Uncertainty about regulations may also act to discourage important capital investment.

Mine safety is another area in which the Federal Government has had to fill a vacuum. The scope of mine health and safety laws was quite limited until the passage of the Coal Mine Health and Safety Act of 1969, which required the coal industry to comply with Federal standards encompassing almost every aspect of day-to-day operations of underground coal mines. Standards were strengthened by the Federal Mine Safety and Health Admendments Act of 1977. This law established a Mining Safety and Health Administration (MSHA) and transferred regulatory authority from the Department of the Interior to the Department of Labor. In addition, the law provided for new procedures to streamline the regulation-making process; increased Federal authority to deal with operators who display an established pattern of violations; greater involvement of miners and procedures affecting worker

health and safety; and improved procedures for collecting and assessing civil penalties imposed for violations.19/

Large-scale coal development can seriously affect the quality of life in coal-producing areas, particularly in the West where development occurs around small and isolated communities. Housing, as well as public services and facilities, are often inadequate to meet the needs of increased population.

This socio-economic impact is aggrevated by several factors. First, there is the "boom-bust" cycle that occurs during the construction and operation phases of coal development. For example, it takes about three times as many people to construct a coal-fired power plant as to operate one. For a small town (under 10,000 population), such a fluctuation makes planning for social services and facilities very difficult, particularly if the construction is labor intensive (as it is in the case of power plants).

19/ The 1969 Act and subsequent amendments have been cited frequently by mine operators as a cause of declining productivity in the underground coal industry because of new costs in time and personnel associated with compliance. The Department of the Interior in the early 1970's reported that fewer new undergound mines were being opened, and that scores of deep mines were being closed because of increased production costs of operating under the new regulations. Nonetheless, the record is clear that the frequency rate per million man-hours for fatalities has shown a steady decline in the last ten years. The 1969 and 1977 Acts also established and improved benefits to workers for black lung disabilities. Regrettably, legislation has been proposed in both the 96th and 97th Congresses to transfer regulatory responsibility from MSHA to OSHA. It is estimated by some that such a transfer may reduce the inspection probability for small mines from a 100 percent probability of two inspections per year to a 5 percent probability of Federal inspection in any one year.

This factor is complicated by the timing and distribution of revenues from coal development. Both communities and their new residents need increased housing, social services, and facilities before the completion of the coal development. Revenues from energy production, however, do not occur until the plant is completed and operating. Prepayment of property taxes to provide needed front-end financing is discouraged by the Internal Revenue Service which refuses to allow local taxes to be deducted from Federal returns until the year in which the local payment is due.

Besides the problem of revenue timing, the revenues collected do not necessarily go to the local jurisdictions in greatest need. The distribution of property taxes creates a disparity between the town actually suffering the adverse impact and the local school district and county. While it is the town which must cope with the consequences of development, it is the counties and school districts to which the revenues are generally channeled, since the development is usually located outside the town's jurisdiction.

To the extent that States make significant impact-related expenditures, they should be permitted to levy and collect severance taxes on their coal resources. The Supreme Court in Commonwealth Edison v. Montana (1981) gave approval, in effect, to the use of these taxes -- excise taxes levied at the mine mouth on the extraction of natural resources -- so long as they are uniformly applied, do not discriminate as between in-state and out-of-state users, and are employed essentially for revenue-raising purposes. The Court seemed to say that the Federal

Government could legislate restrictions, but that the Court would not define which severance taxes were reasonable and which were not. About 25 States today have severance taxes, most of them in small amounts, but States such as Wyoming, Montana, and North Dakota have very substantial ones. S. 178 and H.R. 1313 are bills which would cap severance taxes at a rate of about 12-1/2 percent of the mine-mouth value of the coal. These limitations are favored by utilities and coal importers of the South and Midwest who consider such severance taxes (which are usually passed through) excessive and burdensome.

States are to some extent providing community impact assistance (schools, hospitals, infrastructure, planning, roads, housing). And yet the needs of communities are large and often are not being met. Montana, which has the highest severance tax rate, spends one-fourth of its severance tax revenues on local impact assistance while one-half goes to a trust fund to provide income to minimize the adverse impact of future energy-related development. The remainder goes to general purpose accounts in the State budget. It should be borne in mind that the portion of the tax which goes into the trust fund is viewed by the State as impact assistance for the anticipated "bust" cycle of coal development. Many Western States, and Montana in particular, have economies which are largely based upon the exploitation of nonrenewable natural resources. Because of Montana's history with the copper industry, State policymakers who designed the coal severance tax were sensitive to the need to provide an economic basis for the redevelopment of communities affected by

the bust which many believe will one day follow the coal mining boom.

The Federal budget in its current situation will not permit large expenditures for such Federal assistance to States. The Federal Government has several choices if it wishes to influence the States to provide more impact assistance. It can federalize severance taxes and earmark them for use in addressing local problems; it can prohibit States from taxing Federal coal unless revenues are used for community impact assistance; it can turn back royalties on coal produced from Federal lands, now collected at the Federal level, to State governments for specified purposes; it can develop a mechanism for coal users to provide financial assistance to local communities. It should be noted, however, that many believe the energy-producing States already possess abundant capacity to tax energy resource exploitation activities to the extent needed to deal with the problem.

Early recognition by elements potentially affected by energy development is essential and can go a long way toward dealing with such socio-economic problems. Involvement of the private corporate sector in such activities is essential.20/

20/ "Resource development in the western United States of America offers the prospect of rapid population and economic growth which may dramatically alter the traditional social bases of these rural communities. Reports from other western boomtowns suggests that such rapid growth can lead to substantial community disruption with a disproportionate increase in social problems and an eventual lower productivity in the synthetic fuels industry. Changes related to population growth need not produce such disruptive results. Cooperation among industry, government and community and well-planned and coordinated human services and programs designed to relieve the stresses of change, to provide a sense of community, and to integrate newcomers into the community can reduce or prevent many of the negative impacts as well as reduce overall costs by building on existing resources." "Resource Development, Rural Communities and Rapid Growth: Managing Social Change in the Modern Boomtown" by Jodi Kassover and Robert McKeown in Minerals and the Environment, Volumn III, No. 2, June 1981.

Recommendation #6

To ameliorate adverse environmental effects of increased coal and other fossil fuel use, the Federal Government should expand research efforts designed to define better the effects of increased emissions of carbon dioxide into the biosphere. It should also accelerate research in new technological methods which might be able to reduce or control such emissions from coal consumption and to cope with damage that they may do. And it should step-up its efforts to support international consultative bodies (e.g., the United Nations Environment Program), that would stand ready, as necessary, to issue alerts about prospective environmental danger.

The National Academy of Sciences, the Council on Environmental Quality, and the World Meteorological Association have conducted studies in recent years of the so-called "greenhouse" effect associated with excessive emission of carbon dioxide into the atmosphere. 21/

21/ A team of NASA atmospheric physicists has recently asserted that the buring of fossil fuels is, in fact, creating a global warming effect. The team, which studied historic temperature data, predicted that the mean global temperature will increase by 1 to 4.5 degrees Centigrade by the end of the 21st Century, the precise amount depending on the rate of global energy growth. In addition, two scientists at the National Oceanic and Atmospheric Administration, theorizing that the greenhouse effect has melted more than 10,000 cubic miles of polar ice in Antarctica, have recently stated their belief that such melted ice has caused the water level of the oceans to rise by more than four inches since 1940, triple the rate of the previous 50 years.

This effect is so-named for a phenomenon by which excessive CO2 emissions block the escape of heat into space and thus warm the earth's surface. No definitive conclusion has been reached as to the contribution that the burning of fossil fuels (oil and gas as well as coal) makes in these emissions (tropical deforestation, for example, is suspected to be another important contributor), nor is it clear what the relationship is between these emissions and a warming up of the atmosphere. Finally, it is not certain how much the atmosphere is warming up or how detrimental the effects of this are or may be.

Nonetheless, some of the hypothesized scenarios have been of such a catalysmic nature that the matter must be treated with the utmost gravity.22/ The Energy Security Act, signed by President Carter in August 1980, authorized the appropriation of $3 million for a study of the CO2 problem. This study is continuing, and ought to be enlarged. One problem is that while scientists know how to measure the presence in the atmosphere of carbon dioxide and do this cooperatively with other countries, scientists are not certain how the observence of carbon dioxide emissions relates to climatic changes.23/

22/ A change in the mean global temperature of 2-1/2 degrees Centigrade (the mid-point of the range predicted by the NASA team) would be enough, some scientists think, to alter worldwide precipitation patterns in a dramatic way, creating, among other things, perpetual drought conditions in the western two-thirds of Canada and the United States. It could also, some have speculated, cause the melting of the West Antarctic ice shelf, an occurrence that could result in the flooding, for example, of 25 percent of Louisiana and Florida, and 10 percent of New Jersey.

23/ The National Oceanic and Atmospheric Administration, working with the World Meteorological Organization, maintains an extensive worldwide flask network which continually analyzes samples of atmosphere for purposes of identifying carbon dioxide concentrations. The Department of Energy (DOE) funds and coordinates these activities with the help of the Scripps Institute in California. DOE also funds an effort by the National Bureau of Standards to develop international standards for the measurement of carbon dioxide concentrations.

The United States is currently engaged in a number of international activities devoted to the study of this and related issues.24/

In the last 20 years, an 8 percent increase in carbon dioxide in the atmosphere has been observed; there are now thought to be in excess of 335 parts per million. It is hypothesized that the pre-industrial level of carbon dioxide in the world's atmosphere (i.e., before 1850) was about 290 parts per million.

24/ The World Meteorological Organization (WMO), the International Association of Meteorology and Atmospheric Physics, and the Scientific Committee on Problems of Environment of the United Nations Environment Program represent international groups involved in carbon dioxide research. The WMO is performing in-depth analysis of atmospheric carbon dioxide data collected in its monitoring network. UNEP is designing an environmental assessment program. And, DOE is presently working with the Commission of the European Communities to develop a coordinated exchange of scientific research data. The Office of Energy Research of DOE is the lead agency for carbon dioxide research in the Federal Government. The Interagency Committee on Carbon Dioxide and Climate includes representatives of the Departments of Energy, Commerce, Interior, Agriculture, Defense, and Health and Human Services, as well as representatives of NASA and EPA. The Committee has responsibility for interagency budget planning, program review, information dissemination, and coordination of research. Finally, DOE has established an information system at Oak Ridge National Laboratory to begin coordinating a worldwide data base. Recent discussions, for example, have been conducted with Japanese officials as to the prospective sharing of scientific information on the carbon dioxide issue.

A level of 600 or more parts per million is predicted by some experts for the year 2100, if no change in present trends should occur during the next 120 years, and yet 500 parts per million is considered to represent a serious danger point when the atmosphere would begin to display noticeable changes. 25/ We need to be able to measure as soon as possible whether ice caps are melting, for example, whether sea levels are higher, and other changes that would be associated with an overall volatility of climate.

This situation merits continued close monitoring and scientific study. The time factor in these warnings must be borne in mind; many of the studies about the problem indicate the dangers arising as much as a century from now. And yet, the Committee emphatically considers coal only an interim solution -- what the World Coal Study refers to as a "bridge" -- until early in the next century when it is hoped that reliance on renewable energy sources can be greatly increased. Professor Wilson, in his testimony, repeated the conclusion of WOCOL when he said, "The present knowledge of possible carbon dioxide effects on climate does not justify delaying the expansion of coal use."

25/ Professor Wilson testified: "It is certainly true that accurate measurements show that CO2 in the atmosphere is increasing at about four-tenths of a percent per year, and that's a rate of increase that will certainly double the levels of 330 parts per million in 100 years or so."

While the development of CO2 control methodology is not now on the horizon, research should be conducted into the possibility. Some have argued that research might be conducted on the possibility of storing in soil banks more native and hardier germ plasms (the gene structure in seeds) which could be planted if there were changes in the climate and soil years at any time in the future; hybrid species which have been developed cannot withstand as wide a range of temperature variability. The theory of some scientists should be explored that a carbon dioxide rich atmosphere might actually present an opportunity in which growth systems could benefit if properly adapted, i.e., just as plants prosper in an actual greenhouse environment.26/ But until definitive evidence is in, the use of all forms of fossil energy should be reviewed at regular intervals to provide early warning of danger.

Recommendation #7

Efforts to identify sources and causes of acid precipitation should be accelerated in order that rigorous standards can be both set and enforced to bring the problem of acid precipitation under control. This may require the introduction of new methods of coal cleaning, scrubbing, fluidized bed combustion, gasification, and others.

26/ See, for example, Inadvertent Climate Modification: A Report of the Study of Man's Impact on Climate, Stockholm, 1971. This was a report issued by 30 scientists from 14 countries who engaged in the first comprehensive assessment of man's impact on climate.

Acid precipitation is widely thought to result from the oxides of sulfur and nitrogen reacting with water vapor in the atmosphere, the pollutants themselves coming from the combustion of fossil fuels in a variety of sources (e.g., power plants and automobiles). The acidity of rainfall in the United States has increased in recent years, corresponding somewhat to the increase in U.S. coal use by utilities and the increased use of gasoline-fueled automobiles. Partial control of the pollutants that cause acid rain can be obtained by way of the scrubbing of effluent sulfur oxides (although this can leave a limestone residue, the disposal of which creates its own problems); and fluidized-bed combustion for power plants and three-way catalysts for automobiles seem to be promising technologies for dealing with nitrogen oxides and sulfur oxides.27/ Also, low-sulfur Western coal can be emphasized in preference to Eastern coal.28/ Pre-combustion cleaning of coal also offers an opportunity to reduce pollutant levels, often doing so in a cost-beneficial manner.

27/ Indeed, technology for the fluidized-bed combustion of coal -- a process for "clean burning" that is designed to reduce nitrogen oxide formation and which can also be used to lower sulfur oxide formation -- has been developed and been proven quite effective; some such installations are already in operation.

28/ At the hearing, Chairman Reuss enumerated a number of such proposed remedies and asked witness Russell Train, former EPA Administrator, "These things, as I understand it, do offer the potential of really lowering sulfur oxide and nitrogen oxide emissions, which are apparently the great causes of dead lakes and other problems of that stripe. Is that your impression?" Mr. Train: "That is correct."

Such precipitation is held by some to cause serious environmental problems, including sterility in some lakes, corrosion to manmade materials, possible damage to crops and forests, and possible reductions in soil fertility. The mobilization of mercury and other heavy elements in lake-bottom sediments, something else caused by acid rain, has the potential to interfere with the purity of drinking water supplies. 29/

The government of Canada is embarking on a major program to reduce sulfur emissions in Ontario, by means of installing scrubbers at power plants and special burners at generating stations, and also by increasing the use of low sulfur coal. On the part of the United States, the Clean Air Act Amendments of 1977 have permitted EPA to set stricter emission standards for new coal-fired power plants. Unfortunately, most of the pollution continues to come from older, largely uncontrolled plants.30/

29/ For a thorough and poignant discussion of the environmental consequences of acid precipitation, see Anne LaBastille, "Acid Rain: How Great a Menace?" National Geographic, November 1981.

30/ Chairman Reuss: "Mr. Train, in your judgment, does the Clean Air Act now on the books, if adequately enforced, permit a substantial reduction in sulfur oxide and nitrogen oxide emissions from utility plants?" Mr. Train: "I think it has, in fact, so resulted, but I think, as has been pointed out, about 85 percent of the sources of sulfur are existing sources, to which the new-source requirement does not apply." A predominance of new sources may well explain why it is that thousands of scrubbers are in use in coal-burning utilities and other plants in Japan, whereas in this country fewer than 200 are in operation.

President Carter, in August 1979, established a ten-year Federal Acid Rain Program, an effort which was given the force of law a year later when Congress passed the Acid Precipitation Act. The Act mandates efforts to identify sources and causes of acid precipitation and places the research program to do so under the cochairmanship of the Environmental Protection Agency, the U.S. Department of Agriculture, and the Council on Environmental Quality. A National Acid Precipitation Assessment Plan is now in its final draft stage. The United States has also signed a Memorandum of Intent with Canada to begin negotiations on the study and control of trans-boundary air pollution. EPRI, the Electric Power Research Institute, is also conducting an acid rain research program; the electric power industry maintains, however, that both the extent of ecological damage, and the industry's contribution to the overall problem, are largely unknown.

Recommendation #8

Private capital for mining, transport, and export of increased amounts of coal is readily available and should be mobilized in cooperation with the Federal Government. A program of expanded coal production should be pursued in a "systems" framework, resembling the comprehensive and intensive effort undertaken in getting a man to the moon in the 1960's.

A goal of greatly expanded coal production, use, and export will obviously cost large amounts of money, but if there is a will, such an undertaking should certainly be within the

financial capabilities of a great Nation. Costs of expanding coal production, transport and consuming facilities are indeed considerable but lie within the potential capacity of the capital markets. Of the total capital investment required, three-quarters or more is in coal-using facilities, principally electric power plants, which have longer lead times for planning and construction than mines or transport; and this investment in additional electric power plants ultimately will have to be made whether coal or another fuel is used. But, unlike the synthetics industry, the financing of coal expansion and export will not require government subsidy, with the possible exception of the dredging of ports. Much of the technology required is not inordinately new, and in many cases capital requirements are not out of line with market potential.

By comparison, it should be noted that in the case of synthetic fuels, $3 billion is required to bring on-stream a single plant which produces only 50,000 barrels of oil per day. This is because the technology is not yet proven and the resulting cost per barrel is higher than the OPEC price of oil. In the one instance in which government involvement in financing a coal program might be desirable -- that of port construction -- the projected demand for coal exports is so great that the ports could actually finance themselves over time, repaying the government in the process.

Another issue that must be addressed as one aspect of the total situation is the structure of utility rates and the process for their adjustment. Eugene Samples testified before the

Committee that it is difficult to obtain the rate adjustments which would finance the raising of new capital for plants which would use coal and hence produce cheaper energy.

The need for a "systems framework" was well stated by Secretary Mares in his testimony before the Committee:

> The government can...serve as a catalyst in bringing together parties interested in U.S. coal exports to discuss solutions to potential obstacles. The DOE cosponsored study recently completed by the Western Governors' Policy Office on the future of Western coal exports to the Pacific Basin is an example. The joint study process, involving government, the private sector, and State representatives, has established in both the U.S. and Pacific Basin countries an appreciation of the opportunities and challenges inherent in steam-coal trade.